

TWO NEW SPECIES OF *GEOMYZA* WITH NOTES ON THE *COMBINATA* GROUP (DIPTERA: OPOMYZIDAE)

C. M. DRAKE

22 Park Road, Deeping St James, Peterborough PE6 8ND

Linnaeus's name *combinata* has caused considerable confusion in the genus *Geomyza*. Simple recourse to examining the type specimen does not resolve the problem because, as pointed out by Cogan & Dear (1975), the type specimen is another species. It is, in fact, what is now known as *Opomyza germinationis* L. There is no ambiguity about Linnaeus's description of his *Musca germinationis* as this, in translation, reads '... resembles *Musca* [= *Seioptera*] *vibrans* but the margins of the wings are blackish on the outer edge and tip: the disc is white with several indistinct blackish spots' (Linnaeus, 1761). This fits the currently accepted interpretation of this species and could hardly be applied to *G. combinata* (auct.). There is nothing else in the Linnaean collection that resembles *G. combinata* and there is little doubt that the type was lost and later replaced with the wrong specimen, a view that is supported by the fact that the type for *O. germinationis* is actually a species of *Palloptera* (Brian Cogan, pers. comm.). This raises further problems as *O. germinationis* is the type species of the genus *Opomyza* Fallén.

Linnaeus (1767) described his *Musca combinata* as follows:

combinata. 114. *M[usca]*. *antennis setariis pilosa cinerea, abdomine nigro, alis margine tenuiore puncto nigro.*

Habitat in Suecia.

Magnitudo dupla pediculi. Thorax cinereus. Abdominum nigrum. Alae complicatae fasciis duabus: priore obsoletiore; posteriore magis atra, quae oritur a puncto majusculo nigro, ad marginem tenuiorem utriusque alae, versus posteriora

This may be translated as:

combinata. 114. A fly, antennae with a pilose grey arista, with a black abdomen, and a black spot at the tip of its wings.

It lives in Sweden.

Twice the size of a louse. Thorax grey. Abdomen black. The wings when folded together have two bands, the front one is fainter; the rear one is blacker and arises from a somewhat larger black spot at the tip of each wing toward the rear.

Loew (1864) pointed out that Linnaeus's description, especially that of the wing, did not fit the species then known as *G. combinata* and which Meigen illustrated in the early part of the nineteenth century (reproduced in Morge, 1975). Furthermore, *Geomyza* has a distinctly subplumose arista. The translation rendered here makes sense only if the specimen was described with its wings folded across the abdomen (*complicatae*), and the 'narrower margin' (*marginem tenuiorem*) translated as 'tip'. An alternative interpretation is that Linnaeus was describing *G. tripunctata* Fall. since the wing description is confusing and the thorax is said to be grey, which it is not in any of species in the *G. combinata* group. However, it is more sensible to accept that Linnaeus was referring to a species with a small mark on the dm-cu crossvein and a fainter one on the r-m crossvein.

There are figures and descriptions in the literature for several species in this group. The least ambiguous species are *G. annae* Martinek (1978a), *G. balachowskyi* Mesnil (1934), and *G. hackmani* Narchuk (1984), the genitalia of which are all well illustrated. The last of these species was drawn originally by Hackman (1958) and again by

Vockeroth (1961) who pointed out that it differed from *balachowskyi*, but its formal description was left to Narchuk (1984). Trojan (1962) illustrated a possibly different type of genitalia though it may be a poor figure of *hackmani*.

Another genitalia type under the name *combinata* has broadly rounded surstylar lobes armed with 13–16 closely set teeth arranged around its tip (Mesnil, 1934; Martinek, 1978a; Soós, 1981, and possibly Czerny, 1928). It is not clear whether this is just one species. Mesnil, in his original description of *balachowskyi* in 1934, stated that these two species can be distinguished by differences in the coloration of the abdomen, by a long anepimeral seta in *combinata*, and by the presence of a separate small spot at the tip of the vein M in *balachowskyi*, which he illustrated. He mentioned no marked differences between these species in their wing patterns. However, Balachowsky & Mesnil (1935) illustrated a whole specimen of *combinata* which looks virtually identical to *tripunctata*. Both Collin (1945) and Vockeroth (1961) concluded that Mesnil's *combinata* looked like *tripunctata* and not like *balachowskyi*. Thus it is far from clear what Mesnil's *combinata* looked like but, in my opinion, his careful description should be believed rather than the uncharacteristically inaccurate portrayal of the fly in Balachowsky & Mesnil (1935). Interestingly, Séguéy (1934) illustrated the then usually accepted wing type of *combinata* L. before Balachowsky & Mesnil published their unconventional version.

Two species described by Czerny (1928) may also belong to the *combinata* group: *acutipennis* and *virgata*. The latter is not illustrated and was described from a male. Unlike the other species in the complex, it has only two dc setae so ought to be easily identified. In its description, *acutipennis* differs very little from *combinata* of Czerny but the genitalia of a male from Czechoslovakia (in the Martinek collection) are distinct from others in the complex.

Thus, there are a number of species that fit the Linnaean description of *combinata*. There are two courses of action that may be taken to stabilize the use of this name. The first is to guess what type Linnaeus had and to select a neotype from representative material of the species complex from southern Sweden. The most likely candidates are *balachowskyi*, which is possibly widespread in Europe, and *hackmani* which Vockeroth established, by correspondence with Hackman, is widespread in central and southern Finland, including the islands of Åland adjacent to the Swedish province of Uppland where Linnaeus presumably obtained his specimens. There is a recently collected male of *hackmani* from Kirkkonummi, south Finland, in the Natural History Museum, London. Both are found in England and Russia so it is likely that they occur together in Sweden. The alternative is to reject the name *combinata*, as suggested by Vockeroth (1961), and redescribe the various forms as new species, as has already been done for *balachowskyi* and *hackmani*. However, as *combinata* is the type species of the genus *Geomyza* Fall., it would be expedient to follow the first course of action and select a neotype.

The well-illustrated type of Martinek (1978a) still needs to be described with a new name to remove another of the ambiguities in the use of the name *combinata*. The known distribution of this type, as given below, coupled with the information on the known Swedish species given in Vockeroth (1961) make it unlikely to be the species that Linnaeus described so it is permissible to describe it here before selecting a neotype of *combinata*.

During the preparation of a review of the British Opomyzidae (Drake, in prep.), Dr Vladimir Martinek kindly lent me many species of *Geomyza* from Czechoslovakia and Bulgaria. These included a series of *combinata* sensu Martinek (1978a) and I here describe it in his honour.

***Geomyza martineki* sp. n.**

A small fly with an orange thorax, dark abdomen and yellow legs; wings with a distinct apical spot and both crossveins with small spots; four dc setae and one long subvibrissal seta.

Male

Head. Orange-yellow, face white pollinose and parafacia glistening white, ocellar triangle and vertical plates shining and light brown; occiput, vertex, frons and area between vertical plates sub-pollinose and yellow. Genae at the level of the subvibrissa narrower than the width of the first flagellomere. Antennae pale yellow, first flagellomere with dense short white pubescence; arista sub-plumose. Palps and proboscis yellow. Chaetotaxy normal for the genus; the single strong subvibrissa is almost as long as the anterior orbital seta, and a second genal seta behind it may sometimes be longer than half the subvibrissa's length.

Thorax. Orange except for the brown postnotum; thinly pollinose and slightly shining, sometimes with weak metallic reflections on the upper pleurae. The four dc setae are more or less equally long or the first post-sutural may be weaker; ac setae in four rows with occasional extra setae posteriorly; anepimeron with a 3-4 weak setulae similar to those on other pleura; remaining thoracic setae normal for the genus.

Legs. Yellow with slight darkening on the last few tarsal segments; front femora with a postero-ventral row of 3-5 long setae and a postero-dorsal row of about 4 long setae, interspersed with shorter setae; legs otherwise normal for the genus.

Wings. Clear with a black apical spot spreading posteriorly one-third of the way into cell $r_4 + 5$; the posterior two thirds of this cell is always entirely clear and the end of vein M is never clouded. dm-cu crossvein with a small distinct spot and r-m crossvein with a smaller though still obvious spot, neither extending beyond the long veins. Veins pale brown, darker under the spots, distal half of the stem vein black. Ratio of maximum width, near the dm-cu crossvein, to the length measured from the root is 0.296. Halteres and their stems white (Figure 1m).

Abdomen. Tergites shining, black-brown except the first tergite and basal third of the second tergite which are the same colour as the thorax. Marginal setae on the second tergite about one third of its length, those on the fifth tergite about two thirds of its length, the remaining setae short and scattered. Sternites paler with slightly finer setae.

Hypopygium dull black; in lateral view, the surstylar lobes narrow gradually to the almost parallel, inwardly curved tips which are broadly rounded, sometimes slightly expanded, and curved slightly backwards; the distal margin has an array of about 15 equally small, closely spaced teeth with none widely separated from this terminal group (Figure 1m). Cerci white.

Wing length: 3.15 mm (range 2.90-3.30 mm); maximum breadth near the posterior crossvein 0.93 mm; thorax length 1.41 mm (range 1.28-1.48 mm); total body length 3.44 mm (range 3.25-3.75 mm). Twenty-two specimens were measured.

Holotype. A male, Bulgaria: Albena, Varna, 18.ix.1978, deposited at the Natural History Museum, London.

Paratypes. Four males from the same locality as the holotype, one deposited at each of the Zoologisk Museum, Copenhagen, the Musée National d'Histoire Naturelle and the Institut Royale de Science Naturelle de Belgique, and two males in the collection of V. Martinek; Luxembourg: one male Welscheid, 18.viii.1971, B. H. Cogan, in the Natural History Museum, London, (caught together with *G. balachowskyi*); Czechoslovakia: three males, Bohemia, Branzes-rybn, 5.viii.90, one of which is

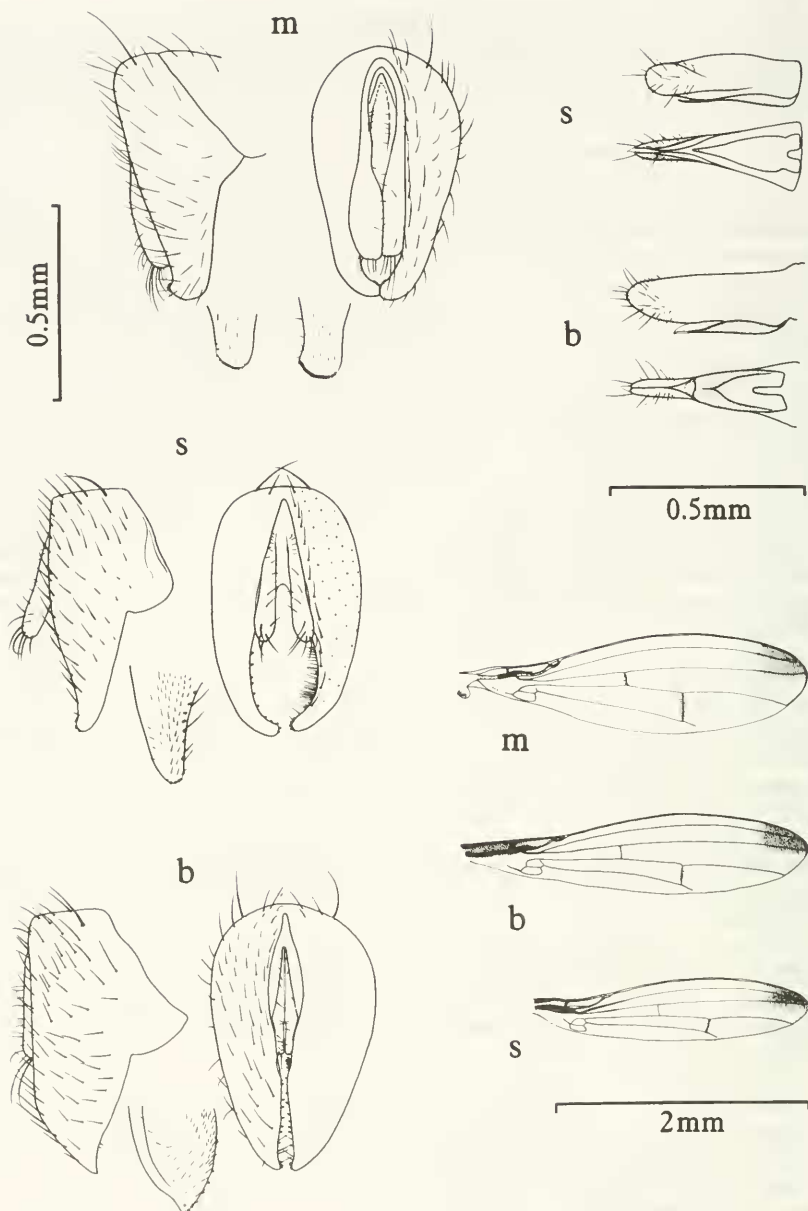


Fig. 1. *Geomyza martineki* sp. n. (m), *G. subnigra* sp. n. (s) and *G. breviseta* Czerny (b); wing and male genitalia in lateral and posterior view, the inner face of the tip of the surstylar lobe and ovipositor in lateral and ventral view.

deposited at the Canadian National Museum, Ottawa; one male, Bohemia, Chabory, Dobruska, 11.viii.66; six males, Bohemia, Otovice, Brovmov, 5.viii.77; one male, Rybn. Rozmberk, 18.vi.77, three males, Bohemia, Banska Stiavnica, 30.viii.77; one male, Bohemia, Noviny p. Balskam, 2.vii.62; five males, Bohemia, Pulice, Dobruska, 11.viii.77 and 16.ix.91; one male, Moravia, Straznice-privoz, 10.vii.74. Except where stated otherwise, all specimens were collected by V. Martinek and are in his collection.

This species is closely related to others in the *combinata* group and for the most part the description above fits *annae*, *balachowskyi* and *hackmani*. Males of *martineki* may be distinguished from these species by the genitalia and from the last two species by the wings. In both *martineki* and *annae* the apical spot has a clearly defined posterior border and there is no shading at the tip of vein M. In *balachowskyi* and *hackmani* the apical spot fades but is still detectable across cell r4 + 5 and becomes darker again over vein M. Although the lengths of the wings are almost the same in the four species, the ratio of width to length clearly separates *balachowskyi* and *hackmani* as narrow-winged species from the other two which are broad-winged species (Table 1). The genitalia of *martineki* closely resemble those of the allotype of *consobrina* Zetterstedt which Hackman (1958) illustrated. However, this species is clearly different from *martineki* because Hackman describes its wing pattern as being very similar to that of *tripunctata*. Soós (1984) gives *consobrina* as a synonym of *apicalis* which has a distinctly different wing to either *tripunctata* or any of the *combinata* groups of species and genitalia that cannot be confused with any of these species.

Martinek (1978b) gives the distribution of *martineki* (as *combinata*) within Czechoslovakia. The material lent to me included specimens from Bulgaria and there is the specimen from Luxembourg in the Natural History Museum, London. As this species is probably the same as that illustrated by Soós (1981), it is presumably also present in Hungary. It is not known from France since Mesnil's *combinata* would appear to be a different species. Its known distribution is therefore central European.

Martinek (1978b) describes *martineki* (as *combinata*) as 'a common species of grass stands of meadows, rivers and brook sides, etc'. However, the details of larval biology he gives were obtained from Nye (1958) who worked on English *combinata*. These were most probably *balachowskyi* since *hackmani* appears to be scarce in Britain and *martineki* has not been recognized here (Drake, in prep.). The food plants of *martineki* are therefore still unknown.

Another new species has been recognized among English material under the name *breviset* Czerny. It is appropriate to give a full description of the true *breviset* to compare with that of the new species.

Table 1. Dimensions of some characters of four species in the *Geomyza combinata* group (mean, M, and range, R).

| | | Wing length (mm) | Wing width (mm) | Wing width/length | Thorax length (mm) | Number measured |
|------------------------|---|---------------------|--------------------|----------------------|-----------------------|--------------------|
| <i>G. martineki</i> | M | 3.15 | 0.93 | 0.296 | 1.41 | 22 |
| | R | 2.90–3.30 | 0.85–1.00 | 0.272–0.325 | | |
| <i>G. annae</i> | M | 3.17 | 0.89 | 0.285 | 1.39 | 3 |
| | R | 3.05–3.28 | 0.85–0.93 | | | |
| <i>G. balachowskyi</i> | M | 2.96 | 0.78 | 0.265 | 1.33 | 18 |
| | R | 2.63–3.13 | 0.68–0.88 | 0.248–0.282 | | |
| <i>G. hackmani</i> | M | 2.96 | 0.74 | 0.248 | 1.39 | 4 |
| | R | 2.80–3.15 | 0.68–0.80 | 0.253–0.259 | | |

Geomyza subnigra sp. n.

A small dark brown fly with yellow legs, dark hind tibiae and a subapical dark mark on the hind femora; wings narrow and short with an apical black spot, a small spot only on the dm-cu crossvein and a conspicuously darkened costal cell.

Male and female

Head. Ocellar triangle and vertical plates shining black-brown, the vertical plates pointed anteriorly; between each vertical plate and the ocellar triangle is a dull orange-brown stripe and these merge anteriorly and extend to the front of the frons; either side of this stripe in front of the vertical plates the frons is dull yellow. Occiput black-brown, pollinose. Face and genae yellow, pollinose, with narrow glistening white parafacia. Antennae yellow in the male, brown in the female, the first flagellomere with white pubescence whose length is about one-quarter that of the segment's width; arista subplumose, the length of the longest hair being about half the width of the flagellomere. Chaetotaxy of the dorsal setae normal for the genus; 2–4 subvibrissal setae are distinct from other genal setae, and are of approximately equal or varying lengths; often the second one is stronger than the others. Palps and proboscis yellow, darker in the female.

Thorax. Ground colour black-brown to completely black (hence the specific name) except postpronotal lobe and adjacent pleura which are often obscurely reddish or yellow; dorsum and parts of the pleurae grey pollinose and moderately shining, the dorsum appearing greyer than the abdomen when viewed from the front; anepisternum and anatergite less pollinose and more shining. Chaetotaxy: three equal dc setae, one anterior and two posterior to the suture, postpronotal seta weaker than the anterior notopleural seta; ac setae in four rows; basal scutellar bristles reduced to setulae similar in size to the ac setae.

Legs. Mostly yellow, including the coxae and all tarsal segments; hind tibiae almost black except for the distal quarter; hind femora with a subapical dark ring or posterior mark which may also be present on the middle femora; anterior femora with 4–7 bristles in both antero- and postero-ventral rows; the longest is slightly longer than the greatest depth of the femora; front basitarsi without ventral combs of short black spines; front coxa with 1–2 setae in addition to the strong apical seta. The legs are otherwise normal for the genus.

Wings. Greyish or brownish with a black apical spot extending posteriorly halfway across cell $r_4 + 5$ and faintly posterior in vein M; dm-cu crossvein with a weak spot not reaching beyond the long veins; no spot on the r-m crossvein which itself is pale; wing base black anterior of a line from the reduced alula to the end of vein R1, cell sc paler but obviously darker at its distal end than the membrane just beyond R1. Veins pale brown proximally and dark brown to black in the distal half, stem vein and costa from its base to vein sc black. Ratio of the greatest width to the length measured from the root is 0.255 (range 0.225–0.280, $n = 30$). Halteres white with black bases to the stems.

Abdomen. Tergites and sternites 1–6 entirely black, grey pollinose but moderately shining and blacker than the thoracic dorsum; the extreme base of first tergite is occasionally pale; length of marginal setae on the second tergite are one third its length and those on the fifth tergite are almost half its length in the male, and almost equal to its length in the female. Hypopygium black, the pair of dorsal setae small, barely twice the length of adjacent setulae; surstylar lobes taper to inwardly curved and narrowly rounded tips which have an array of 6–7 closely spaced blunt black teeth and 1–7 widely spaced teeth along the internal posterior edge; the internal faces have

numerous hairs; cerci pale to dark, the length of the articulated section that protrudes being about one-third the depth of the lobes, extending about two-thirds down them and clearly visible between them in posterior view (Figure 1s). Female seventh tergite pale, the sternite often black; ovipositor dark or at least not as pale as the femora, with one strong dorso-apical, one apical and two ventral pairs of setae which are longer than the others; the ventral sclerite tapers evenly to a pointed tip (Figure 1s).

Wing length: female 2.5 mm (range 2.33–2.70 mm, $n = 15$), male 2.45 mm (range 2.20–2.70 mm, $n = 17$); thorax length: female 1.26 mm (range 1.15–1.35 mm), male 1.22 mm (range 0.95–1.25 mm); total body length: female 3.10 mm (range 2.75–3.75 mm), male 2.90 mm (range 2.5–3.25 mm).

Holotype. A male, England: Bamburgh, Northumberland, 12.vi.90, C. M. Drake, deposited in the Natural History Museum, London.

Paratypes. England: two females from the same site as the holotype; two females and two males from Winterton Dunes National Nature Reserve, 9.viii.91, C. M. Drake; two females and three males, The Crumbles, Kent, 22.ix.88, A. Godfrey; three females and two males, Gibraltar Point National Nature Reserve, Lincolnshire, 26.viii.91, C. M. Drake. Paratypes have been deposited in the collections of the museums listed under *martineki*, and some are in the author's collection.

Other material seen. England: one male, Faversham, Kent, 19.vi.49, S. Wakely (Natural History Museum, London); a pair *in cop.*, Kew, Surrey, 19.ii.77, V. F. Eastop (Natural History Museum, London); two males and four females, Egham, Surrey, 13.xi.70, J. Ismay (Natural History Museum, London); one male, Caister St Edmunds, Norfolk, 5.ix.73, J. W. Ismay (Norwich Castle Museum); one male, Hevingham Church, Norfolk, 24.x.71, J. W. Ismay (Norwich Castle Museum); four males and two females, Castor Hanglands National Nature Reserve, Cambridgeshire, 10.vi.87, C. M. Drake; one male, Bredon Hill, Worcestershire, 17.vii.87, D. A. Sheppard; eight (males and females), Cheswick Links, six (males and females), Newton Links, 16 (males and females), Bamburgh, five (males and females), Almouth, Northumberland, all between 12.vi and 17.vii.90, C. M. Drake. Scotland: two males and four females, Kinrara, Inverness, 17.vii.91, J. W. Ismay (Ismay collection). Czechoslovakia: nine males, Kopeč, Bohemia, 22.vi–28.viii.83, V. Martinek; one male, Praha, Bohemia, 27.ix.81, V. Martinek.

Geomyza subnigra is an uncommon species in Britain and Czechoslovakia though less so than the true *breviseta* with which most of the above records were confused. The European distribution summarized for *breviseta* in Soós (1984) may therefore refer to *subnigra*. The habitats include birch woodland, several coastal dune systems in eastern England and ungrazed grassland dominated by *Arrhenatherum elatius* (L.) Beauv. ex J. & C. Presl. The fly has been seen running about deep within the tussocks of this grass on several occasions. If this was the species that Ismay (1974) found, he recorded it at the roots of tussocks of *A. elatius* throughout the year, though it was most abundant in autumn and winter. A pair of specimens in the Natural History Museum, London, were caught *in cop.* in mid-February. The species therefore has an unusual life history for this genus, whose commoner species overwinter as larvae.

Geomyza breviseta Czerny, 1928

A small dark reddish-brown fly with yellow legs, dark hind tibiae and a posterior dark mark on the hind femora; wings narrow and short with an apical black spot, a small spot on only the dm-cu crossvein, and a dark base.

Male and female

Head. Ocellar triangle and vertical plates shining black-brown, the vertical plates pointed anteriorly; between each vertical plate and the ocellar triangle is a dull orange-brown stripe and these merge anteriorly and extend to the front of the frons; either side of this stripe in front of the vertical plates the frons is dull yellow. Occiput pollinose, black-brown, paler at the margins. Face and genae yellow, pollinose, with narrow glistening white parafacia. Antennae yellow, the first flagellomere with silvery pubescence the length of which is about one-third the segment's width; arista subplumose, the length of the longest hair being about half the width of the flagellomere. Chaetotaxy of the dorsal setae normal for the genus; 3–5 subvibrissal setae are distinct from other genal setae, and are of varying lengths; often the second one is stronger than the others, though sometimes all are approximately equal in length or only one of a pair, not always the second pair, is stronger. Palps and proboscis yellow.

Thorax. Ground colour black-brown to chestnut brown except postpronotal lobe, notum in front of these lobes, pleurae between lobes and front coxae and much of the scutellum which are orange-yellow or reddish; dorsum and parts of the pleurae grey pollinose and moderately shining but not markedly greyer than the tergites; anepisternum and anatergite less pollinose and more shining; the pleurae frequently show metallic reflections. Chaetotaxy: three equal dc setae, postpronotal seta weaker than the anterior notopleural seta; ac setae in four rows; basal scutellar bristles reduced to setulae similar in size to the ac setae.

Legs. Mostly yellow, including the coxae and all tarsal segments; hind tibiae almost black basally, becoming yellow in the distal half or less; hind femora with a black mark in the middle half of the posterior surface, occasionally spreading to form a black band beyond the middle; anterior femora with 4–7 bristles in both ventro- and dorso-posterior rows; none longer than the greatest depth of the femora; front basitarsi without ventral combs of short black spines; front coxa with one or rarely two setae in addition to the strong apical seta. The legs are otherwise normal for the genus.

Wings. Greyish or brownish with a black apical spot extending posteriorly halfway across cell $r_4 + 5$ and faintly posteriorly of vein M in English specimens but not in Swiss specimens; dm-cu crossvein with a weak spot not reaching beyond the long veins; no spot on the r-m crossvein which itself is pale; wing base black anterior of a line from the reduced alula to about half-way along the costal cell though intensity fades distally so that the distal end of the costal cell is almost as clear as the membrane beyond R1. Veins pale brown, dark brown to black within and near to the spots, stem vein and costa from its base to vein sc black. Ratio of the greatest width to the length measured from the root is 0.241 in English specimens (range 0.217–0.268, $n = 18$) and 0.272 in Swiss specimens (range 0.250–0.287, $n = 8$). Halteres white with black bases to the stems.

Abdomen. Tergites and sternites 2–6 entirely black, the first tergite sometimes pale basally, grey pollinose and moderately shining; the length of marginal setae on the second tergite are one-third its length and those on the fifth tergite are almost half its length in the male and approximately equal to its length in the female. Hypopygium black, more bulbous than in most other *Geomyza* species; the pair of dorsal setae small, barely twice the length of adjacent setulae; surstyler lobes evenly convex in the lower half so that in both lateral and posterior views they curve smoothly to the slightly mucronate and conspicuously shiny tip; the tips of the lobes have an array of 6–8 closely spaced blunt black teeth, the internal posterior edge has about ten teeth spaced from near the tip to the level of the cerci, together with numerous short hairs; cerci white, very short and narrow, the length of the articulated section that protrudes

being barely one-quarter of the lobes' depth, extending little further than halfway down them and often barely protruding from the narrow gap between them (Figure 1b). Female sixth tergite more shining than the anterior ones; the seventh tergite and sternite are whitish except at the base; ovipositor yellow-orange with one dorso-apical, one apical and two ventral pairs of setae which are longer than the others; ventral sclerite excised apically with a transparent semi-circular extension (Figure 1b).

Dimensions. Eighteen English and ten Swiss and German specimens were measured. The English flies were slightly smaller and their wings were narrower relative to their length.

Wing length. English females 2.40 mm (range 1.95–2.63 mm, $n = 9$), males 2.33 mm (range 2.08–2.68 mm, $n = 9$), Swiss and German females 2.83 mm (range 2.70–2.93 mm, $n = 5$), males 2.58 mm ($n = 3$). **Thorax length:** English females 1.17 mm (range 0.92–1.43 mm), males 1.11 mm (0.95–1.25 mm), Swiss and German females 1.33 mm (range 1.25–1.40 mm), males 1.21 mm (range 1.12–1.28). **Total length:** English females 3.29 mm (range 2.75–4.0 mm), males 2.92 mm (range 2.85–3.65 mm), Swiss and German females 3.28 mm (range 3.00–3.60 mm), males 3.10 mm (range 2.75–3.30 mm).

Material seen. Type specimens (1 male and 1 female mounted together) and 1 female syntype, Berlin, Germany, in the Oldenberg collection at the Deutsches Entomologisches Institut, Berlin; England: 5 males and 8 females, Folkestone, Kent, England, June 1986, C. M. Drake; 3 males and 1 female, Barnack Hills and Holes National Nature Reserve, Cambridgeshire, 18.vii.91, C. M. Drake; 1 male, Coombe Bisset, Wiltshire, England, C. H. Andrewes (in the Natural History Museum, London); 1 male, Pieces Bank, Rotherham, S. Yorkshire, 4.ix.82, W. A. Ely; Switzerland: 3 males and 4 females, Vezia, 9.vii–28.x.1979, C. Dufour & W. Geiger, sent to the author by J. Haenni of the Musée d'Histoire Naturelle, Neuchâtel.

The specimens from Kent were collected in pitfall traps set in ungrazed chalk grassland and those from Barnack Hills and Holes NNR were from tussocks of *Bromus erectus* Huds. mixed with some *A. elatius* in moderately tall, calcareous grassland which was lightly grazed by sheep. The Swiss specimens were caught in a continuously operated illuminated Malaise trap at an altitude of 410 m. On the limited information available, it is possible that this species is restricted to calcareous grassland. Judging from the few records in Britain, it is a scarce species.

Geomyza subnigra closely resembles *G. breviseta*. *Geomyza breviseta* is usually a redder fly with a more extensively pale anterior dorsum, pleurae and scutellum, has less contrast between the thoracic and abdominal dusting, and has more marked metallic reflections on the paler parts of the thorax. The dark shading in the costal cell beyond vein h continues more or less to the end of the cell in *subnigra* but fades distally in *breviseta*. These external characters are somewhat comparative and should not be relied on entirely. Males are easily distinguished by the genitalia even if these are not withdrawn because the cerci are very small in *breviseta* but of normal size in *subnigra*, that is, similar to those of *tripunctata*, and the gap between the lobes is a narrow slit in *breviseta* but an obvious lozenge shape in *subnigra*. The females may be distinguished if the last sternite is mounted or viewed in alcohol; the ventral sclerite is apically emarginate in *breviseta* but produced to a narrow and faint point in *subnigra*. The seventh sternite and ovipositor are often dark in *subnigra* but pale in *breviseta* but this may not be a reliable character. The range of dimensions of the thorax and the wings are virtually the same in both species, and the differences in the size of the wings in Figures 1b and 1s are not species-specific: that of *subnigra* is of a female whereas that of *breviseta* is of a male and both are within the range of variation for the species. The angle of the crossveins is variable and of no diagnostic value.

Geomyza subnigra runs to either *brevisetata* or *hendeli* Czerny in the keys of Collin (1945) and Czerny (1928), depending on how well differentiated the longest subvibrissal bristle is, but it clearly does not fit the description of *hendeli*. Three other European species have dark thoraxes so superficially resemble *subnigra* and *brevisetata*. *Geomyza paganettii* Strobl and *G. denigrata* Czerny have broad wings whose widths are about 34% of their lengths, measured from Czerny's (1928) figures, and *paganettii* has four dc setae. Soós (1981) illustrated the genitalia of *paganettii* which resemble those of *subnigra*. I have not seen specimens of *paganettii* but Martinek (1978) recorded both this species and *subnigra* (as *brevisetata*, seen by me) so they are presumably distinct. Oldenberg (1910) described *G. fusca* which Czerny (1928) synonymized with *paganettii*. The type of *fusca* was unfortunately not available for loan at the time of writing so has not been inspected but the type specimens of *brevisetata* were originally identified by Oldenberg as *fusca* according to his determination label on these specimens. There is a possibility that, if the type of *fusca* has only three dorsocentral setae, *subnigra* is this species since they are obviously very similar in other respects. *Geomyza adusta* Loew and *G. denigrata* have only vaguely darkened wing tips and neither crossvein is darkened. There is a male and female collected from Macedonia in the Natural History Museum, London, of a species that resembles *brevisetata* and *subnigra* and has genitalia similar to those of *subnigra* but differs markedly in its much broader wings which are 30% of their length. They do not agree with any of the descriptions in Czerny (1928) and may represent a new species.

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BOOK REVIEWS

A review of the scarce and threatened Hemiptera of Great Britain, UK Nature Conservation No. 2 by Peter Kirby. Joint Nature Conservation Committee, Peterborough, 1992, 268 pages, £9 paperback.—This amounts to a Red Data Book of bugs, although it professes not to be one. It covers 242 of our rarer insects, being 143 true bugs of the sub-order Heteroptera and 99 leaf-hoppers of the series Auchenorrhyncha. The aphids, psyllids, white-flies and scale insects of the series Sternorrhyncha are excluded, since not enough is known about their distribution and status. In decreasing order of rarity, species are classified as endangered, vulnerable, rare or notable, with selection for the latter category based on estimated occurrence in fewer than a hundred 10-km squares in Great Britain. Species already extinct are included, in the hope that they may be rediscovered. By comparison, the Red Data Book for insects (Shirt, D. B. (ed.) 1987. Nature Conservancy Council, Peterborough) had only sufficient space to cover the 20 Heteroptera in the two highest categories, while just listing the names of 53 species classed as rare together with the few extinct species. The present work makes a few recommendations for changes to the status of species given by Shirt.

The main part of the book consists of a data sheet for each species in a standard format, with the headings identification, distribution, habitat and ecology, status, threats, conservation and references. These are written as independent documents so that they may be photocopied and stored separately, for instance in the file on a conservation site where the insect occurs. However the data sheets do run across page boundaries. Each identification entry, apparently very simple, has in fact been carefully thought out, being a reference to just those works necessary for the identification of the species concerned. The sections on distribution and habitat give up-to-date information for each species. Sites are named where appropriate, but the distribution is generally given as a list of pre-1974 counties, since most distributional work on bugs was done in that way. This gives a satisfactory overall picture, and is perhaps preferable to alternative methods. The sections on conservation inevitably